DOCUMENT RESUME

ED 465 611 SE 066 333

AUTHOR	Morrison, J.; McDuffie, A. Roth; Akerson, V.
TITLE	A Focus for Collaboration: Developing and Implementing Science and Mathematics Performance Assessment Tasks.
PUB DATE	2002-01-00
NOTE	21p.; In: Proceedings of the Annual International Conference of the Association for the Education of Teachers in Science (Charlotte, NC, January 10-13, 2002); see SE 066 324.
AVAILABLE FROM	For full text: http://aets.chem.pitt.edu.
PUB TYPE	Reports - Evaluative (142) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Educational Change; Elementary Secondary Education; *Faculty Development; *Mathematics Teachers; *Methods Courses; *Performance Based Assessment; *Science Teachers

ABSTRACT

According to national and state reform efforts in science and mathematics education, new forms of collaboration to foster integrated professional development for teachers are needed. These collaborations are seen as a means to involve practitioners and theoreticians in teacher education. Due to the participation of many players, collaborative efforts in teacher education draw upon a wide field of expertise, experiences, and perspectives. This paper describes a collaboration formed between university researchers, practicing teachers, and personnel from the local educational service district. This collaboration was formed to focus on increasing preservice and inservice teachers' understanding and use of performance assessment through a field based experience in K-8 mathematics and science methods courses. (Contains 15 references.) (Author)

Reproductions supplied by EDRS are the best that can be made
from the original document.

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

ED 465 611

A FOCUS FOR COLLABORATION: DEVELOPING AND IMPLEMENTING SCIENCE AND MATHEMATICS PERFORMANCE ASSESSMENT TASKS

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY
P. Rubba
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

J. Morrison, Washington State University
A. Roth McDuffie, Washington State University
V. Akerson, Indiana University

According to national and state reform efforts in science and mathematics education (National Council of Teachers of Mathematics [NCTM], 2000; National Research Council [NRC], 1996), new forms of collaboration to foster integrated professional development for teachers are needed. These collaborations are seen as a means to involve practitioners and theoreticians in teacher education. Due to the participation of many players, collaborative efforts in teacher education draw upon a wide field of expertise, experiences, and perspectives. This paper describes a collaboration formed between university researchers, practicing teachers, and personnel from the local educational service district. This collaboration was formed to focus on increasing preservice and inservice teachers' understanding and use of performance assessment through a field based experience in K-8 mathematics and science methods courses.

Performance Assessment

Science and mathematics reform efforts (American Association for the Advancement of Science [AAAS], 1993; NCTM, 2000; NRC, 1996) have called for students becoming more involved in their own learning based on the philosophy that student understanding is facilitated by active involvement. The science and mathematics reforms have required students to not only answer questions accurately but to explain the process they used to derive their response. Performance assessment has been recommended to assess students' understanding of concepts in science (Shymansky, Chidsey, Henriquez, Enger, Yore, Wolfe, & Jorgensen, 1997). Well designed assessment tasks not only assess student understanding but teach concepts and require

ED 463333

BEST COPY AVAILABLE

BEST COPY AVAILABLE

students to explain and communicate their solutions (Darling-Hammond & Falk, 1997; Shepard, 2000). Performance assessment is well-suited to this purpose because of its focus on the application of knowledge in an authentic context for an authentic purpose. Kelly and Kahle (1999) found that science students who took performance assessment tests were better able to explain their reasoning and conceptions than students who took traditional tests, leading to the conclusion that they had stronger understandings as a result of working through the performance task. When studying the effects of classroom based performance assessment-driven mathematics instruction, Fuchs, Fuchs, Karns, and Katzaroff (1999) found that students in performance assessment-driven instruction classes demonstrated stronger problem solving skills than comparison groups that were not performance assessment-driven. Borko, Mayfield, Marion, Flexer, and Cumbro (1997), in a study of a professional development program which stressed using performance assessment strategies in mathematics instruction, found that teachers changed their instructional practices to incorporate using more problem solving activities, requiring student explanations of strategies, and using rubrics for assessment of open-ended tasks. Thus, implementing performance assessment in mathematics and science classrooms appeared to be a promising approach both for preservice teachers' learning and inservice teachers' professional growth.

Field-based Experience

In this collaborative project, the emphasis was on the development of preservice teachers' understanding and ability to implement performance assessment in the classroom. To that end, this project focused on a field-based experience for preservice teachers enrolled in a K-8 science or mathematics methods course.

Both educational researchers and students bound for a teaching career agree that there is a need for more direct, specific, and practical experiences in classrooms prior to student teaching (Anderson & Mitchener, 1994; NRC, 1996). Field experiences early on in the teacher training have a lasting effect. Schoon and Sandoval (1997) indicate that more "real-world" opportunities for preservice teachers to practice their skills will help them gain necessary skills faster. Borko, et al. (1997) emphasize the importance of situating preservice teacher learning in classroom practice. Putnam and Borko (2000) argue that for teachers to construct new knowledge about their practice, the learning needs to be situated in authentic contexts. Preservice teachers need a combination of university learning for theoretical foundations and school-based learning for a situated perspective. Spector (1999) recommends having preservice teachers work with inservice teachers to help them better apply newly learned teaching and assessment strategies. This finding is in line with Dickinson, Burns, Hagen, and Locker's (1997) finding that important changes in science teaching can take place with the support of an enthusiastic peer.

As well as providing valuable experiences for preservice teachers, field-based experiences are beneficial for the inservice teachers who are involved in mentoring the preservice teachers. The inservice teachers are exposed to new strategies and techniques, share their own strategies and techniques, and collaborate in the evaluation of student work. Learning experiences for both preservice and inservice teachers must include inquiries into the difficulties and questions teachers regularly face (NRC, 1996). It is essential that teachers, both preservice and inservice, have opportunities to observe, practice, and evaluate appropriate assessment tasks. The National Science Education Standards (NRC, 1996) discuss the need for teachers to be involved in the design and implementation of assessment.

> Teachers must have opportunities to observe practitioners of good classroom assessment and to review critically assessment instruments and their use. They need to have structured opportunities in aligning curriculum and assessment, in selecting and developing appropriate assessment tasks, and in analyzing and interpreting the gathered information. Teachers also need to have opportunities to collaborate with other teachers to evaluate student work-developing, refining, and applying criteria for evaluation. (p. 67)

Goals

The goals of this project were to introduce preservice teachers to performance assessment through its development and implementation and to increase the understanding of performance assessment tasks in practicing teachers. Providing the preservice teachers with a chance to be in their mentor's classroom observing students and actually implementing their performance assessment task was a high priority of this project. A secondary goal was to establish a collaborative partnership between university science and mathematics methods instructors, the local educational service district personnel, and inservice teachers from local school districts.

Collaborative Partners

The collaboration between Washington State University-TriCities (WSU-TC), the Educational Service District 123 (ESD), and teachers from six local school districts in southeastern Washington state was the backbone of this project. The partners had specific roles and objectives in the project. Two university faculty, one mathematics and one science educator, were each responsible for developing a methods course that incorporated a performance assessment sector in which preservice teachers were introduced to performance assessment, designed a performance assessment task, received feedback from the instructor, and then implemented the task. The university faculty collected data on all aspects of the preservice teachers' thinking and written projects. The ESD math/science specialist was responsible for selecting mentor teachers, providing them with information on performance assessment, and

communicating with the teachers as the project progressed. The mentor teachers were paid a stipend ($150 per semester) for their time through external funding received and administered by the ESD. The ESD partner set up formal meetings between the preservice and inservice teachers. All communication with the mentor teachers was done by the ESD staff, this included a survey on their understanding of performance assessment, the rating of the preservice teachers' implementations of the tasks, and their feedback on the overall project. This involvement of the ESD partner was a key factor in the project because there was no field component required for the methods classes and no faculty at the university to handle field placements.

The two university faculty members and ESD math/science specialist were the primary collaborators in this project with the inservice teachers playing a more secondary role. They did not attend the planning meetings or take part in the development of the project. The inservice teachers were responsible for mentoring the preservice teachers as they developed a performance assessment task. This mentoring took place at an initial meeting of all participants and through phone or e-mail communications. The inservice teachers also provided the classroom where the task was implemented and gave feedback at the completion of the performance assessment task in their classroom.

Program Description

This project initially began during the spring semester of the 2000 school year. Three teacher leaders were selected to work with a university mathematics educator on performance assessment tasks. These teachers mentored 10 preservice teachers as they developed a mathematics performance assessment task. The task was then implemented in the mentor teachers' classrooms. During the fall semester of 2000, 19 preservice teachers from a science methods class and 10 mentor inservice teachers were involved in the project. The preservice

teachers developed a performance assessment task and received feedback from their science methods instructor and their mentor teacher. As these semesters did not involve all the collaborative elements in place during the spring semester of 2001, they will not be discussed in depth; however it is important to stress that the foundations for this collaboration developed from the onset of the project. The collaborative partnership that was established in November, 2000, will be the focus of this paper.

By January of 2001, a group of 54 preservice teachers, enrolled in either a science or mathematics methods course, and 25 mentor teachers selected by the ESD were ready to begin the project. Some of the preservice teachers in this group had already participated in the project during their fall science methods course, involving them in a second performance assessment task experience added depth to our conclusions. The mentor teachers were selected from a list of recommended teachers; the list was comprised of exemplary science and mathematics teachers from eight school districts in the area around the university. After agreeing to participate, the mentor teachers were sent a packet of information on performance assessment and attended an introductory meeting at the university.

Prior to beginning their science or mathematics methods class, the preservice teachers were surveyed and interviewed on their views and understanding of performance assessment. The preservice teachers were then given in-depth instruction on designing and implementing performance assessment tasks. After lengthy collaboration between the preservice teacher and their mentor, a science, mathematics, or combined science and mathematics performance assessment task was developed.

The preservice teachers worked either individually or in pairs on the performance assessment project but each student was required to complete three parts of the assignment. The

first part involved reviewing a minimum of two journal articles on their topic to gain an understanding of the teaching and learning issues surrounding their topic. The preservice teachers also were asked to complete a plan for their performance assessment task. The second part of the assignment involved of an overview of the task, references used in development of the task, alignment of the task with state/national standards, special instructions, and any materials needed for the implementation of the task. A copy of the task as it would be administered to students and the scoring rubric were also included in this part of the assignment. After the task was taught in the classroom, the preservice teacher turned in a final draft of the task as it was presented to students, the final rubric, and any mentor teacher comments that were given. Samples of scored student work were included as were analyses of students' understanding based on their performance on the task. Also included in this section were reflections, implications, and suggestions for the improvement of the task. In addition, the preservice teachers provided reflections on their collaboration with their mentor.

The preservice teachers were videotaped implementing their performance assessment tasks in the classrooms by their mentor teachers or another project partner. After implementation of the task, the preservice teachers were interviewed a second time and again completed the survey of their understanding of performance assessment. The mentor teachers filled out a survey on their views of performance assessment, the performance assessment task implemented in their classroom, the mentoring process, and the overall project.

Throughout the project, the university faculty and the ESD math/science specialist met regularly to determine the progress of the project. These meetings were held weekly for the first two months of the project and then bimonthly for the remainder of the project. Typically the meetings lasted two hours and involved discussions on the progress of the overall project and

specific individual concerns and frustrations about the preservice teachers, inservice teachers, or performance assessment tasks. The two university partners and the ESD partner all communicated via e-mail and phone conversations regularly throughout the project, often every day. To ensure that all conflicts and concerns were aired and addressed, the main partners in the collaboration felt it was necessary to communicate openly and consistently.

One of the major jobs of the partnership was to pair the preservice teachers with the inservice mentor teachers. The university faculty knew the preservice teachers, the ESD member knew the inservice teachers. This pairing required lengthy discussion of the characteristics of all participants and the ultimate establishment of a single or pair of preservice teachers matched with a mentor teacher who would be most compatible with them. Other activities the partnership was involved in consisted of setting up inservice/preservice teacher meetings, interviewing participants, videotaping preservice teachers, reviewing performance assessment tasks, and planning for future projects.

Program Evaluation

Both the strengths and weaknesses of the project were evaluated. The success of the collaboration was based on a variety of aspects. The primary goal of the project was to positively affect teachers' understanding of performance assessment through implementation in a field-based situation. The secondary goal was to establish a collaborative partnership between university science and mathematics methods instructors, the local educational service district personnel, and inservice teachers from local school districts.

Understanding of Performance Assessment

Prior to intervention, the preservice teachers had very little understanding of performance assessment as indicated by low scores on the coding scheme used (Fuchs et al, 1999) to score the

surveys and interviews. Initially, examples given by preservice teachers included very few of the components necessary to a performance assessment task: their examples tended to be short, required single answers, and did not provide opportunities for their students to generate ideas. Additionally, none of the preservice teachers said they would require students to explain their work or provide a written communication about their work when doing a performance assessment task. Their ideas of performance assessment were not couched in an authentic task.

Following the design and implementation of their task, the preservice teachers' understanding of performance assessment improved greatly. Analysis of the data show that the preservice teachers did come to understand assessment as a formative process, they also constructed ideas of what performance assessment is, when it is useful, and when it is not appropriate. All preservice teachers required from their students written explanation of strategies, modeling of strategies, and multiple questions that required application of knowledge set in an authentic context. The preservice teachers provided substantive analyses and interpretations of students' thinking, understandings, and lack of understandings. The following quotes represent two of the preservice teachers' views of performance assessment after the performance assessment task implementation (May, 2001).

> ...performance assessment is a task which has a real world problem to assess students' understanding of a topic. It is most appropriate to assess what someone already knows, like at the beginning to see what someone already knows about it, or at the end to evaluate what they have learned and how your teaching has helped them to understand that concept. (Tara, post-interview)

> Performance assessment I would define as sort of an assessment project that engages the students to use all they have learned to solve a problem that kind of involves all they know. (Karin, post-interview)

Analysis of the mentors' responses on the surveys showed that they learned more about performance assessment strategies and gained ideas for their own teaching through their

involvement in the project. The majority of the mentor teachers had had some professional development on performance assessment in the past; all but seven said that they learned something new from this project. The mentor teachers expressed the following quotes on the surveys collected in May, 2001.

> Having not had much experience w/design of PA (performance assessment), I learned a great deal about how to focus the task and clarify it for students. (Paul, survey)

> This task also helped me see that I need to do more assessment tasks frequently and expect more writing out of them (students). (Ann, survey)

> I saw the breadth of concepts that could be integrated in one task. I saw the students enthusiasm for each project and I saw the processing of information and the problem solving taking place in each group. (Carol, survey)

Field-based Experience

The situated nature of the project (i.e. designing a task for actual students, working with an experienced teacher, and administering the task in a school classroom) seemed to be the most important factor in solidifying the preservice teachers' interest in and learning from the project. The preservice teachers felt that the field experience was beneficial to their training, for many of them this was the first time they had taught a lesson in a "real" classroom. The quotes of the preservice teachers that follow were expressed on a survey administered in the fall of 2001.

> It was a nice safe way to teach a lesson for the first time. If it bombed, I didn't have to go back and face everyone, but I could still learn from it. (Ginny, post-project survey)

> The experience overall was very good…Simply working with real students as well as designing and implementing a performance task. (Roy, post-project survey)

> I needed the classroom experience. It was exciting to see the kids working on this. (Beth, post-project survey)

> This project was an excellent opportunity to work with an actual math class. It gave me a good picture of what the students know and how they can learn. (Karin, post-project survey)

The preservice teachers felt that the mentoring they received from the inservice teachers was extremely beneficial. They met personally, e-mailed, or talked on the phone with their mentors as they worked on designing their performance assessment tasks. The inservice teachers successfully provided the preservice teachers with information on the students they would be teaching, the school situation, and the time they could use for implementation of the task. The main complaint that was expressed by the preservice teachers was that the inservice teachers did not provide adequate feedback after the implementation of the performance assessment task.

> I would have liked to have written feedback. Perhaps on a few pre-ordained questions. (Dana, post-project survey)

> It would have been nice to even get some constructive criticism (she may not have felt comfortable doing that). (Carol, post-project survey)

The lack of adequate feedback from mentor teachers to the preservice teachers after the implementation of the task was seen as one of the weaknesses of the project. In the description of their duties as a mentor, the mentor teachers were asked to "provide feedback on the implementation of the performance assessment task in the classroom" to the preservice teachers. It was seen by the preservice and inservice responses that more specific directions needed to be given to the inservice teachers on how much and what type of feedback to provide.

Many of the preservice teachers were frustrated when they attempted to schedule meetings or receive feedback from their mentors. They had difficulty understanding just how busy a full-time teacher is. The preservice teachers also were frustrated by the mentors' lack of understanding of performance assessment and the large amount of time necessary to administer their tasks.

The situated nature of the project also provided a learning opportunity for the inservice teachers. The majority of the inservice teachers ranked the success of the project as high and mentioned that observing their students being taught by the preservice teachers had given them more information about their students and was very helpful to them. The inservice teachers provided the following quotes on the survey they took in May, 2001, at the end of the project.

> It (performance assessment task) showed me at what level they (students) are at on measurement. (Pat, survey)

> I learned a great deal about kids number sense and I did use what I saw as areas they struggled with as the focus of a few math lessons. (Kate, survey)

> They (preservice teachers) were both tentative about taking charge of the task but the performance assessment had such a high interest level that students were interested in getting started. (Dale, survey)

The inservice teachers' awareness of what preservice teachers are required to do in their university science and mathematics methods classes increased through participation in this project. When asked what they perceived as a strength(s) of this performance assessment project, many expressed delight at the quality projects that the preservice teachers produced. The inservice teachers also felt they benefited from their participation in this project through strengthening their mentoring skills.

> Working with a "new" person, I learned you really have to focus your area of study. (Fran, survey)

> It affirmed my strong belief in observable assessment for young learners. It gave me a chance to teach someone else techniques I have developed. (Kim, survey)

One frustration expressed by the inservice teachers was the preservice teachers' lack of knowledge about student learning and classroom control. They seemed more confident with providing feedback on the classroom management abilities of the preservice teachers than providing comments on aspects of the performance assessment task implementation.

> Her preparation was very thorough. She tried to give good comprehensive directions but never stopped to monitor if the kids understood her. (35 minutes of straight directions!) The kids did not understand the concept or what Cari wanted. (Gail, survey)

> The lesson went fairly well. The lesson was well planned and the content was excellent. The lesson lacked effectiveness in the delivery and management. (Tara, survey)

The science and mathematics educators at the university felt that the field based aspect of the project was successful. Being able to include a field based experience for their methods students was a benefit of the project as no field component had been involved in either methods course prior to this project. Moreover, the experience was one that truly situated the learning goals of the methods classes in the schools overcoming the challenge discussed by Putnam and Borko (2000) of field placements that are inconsistent with learning goals. The university faculty members reflected on the project as follows:

> I felt good that this gave the students the opportunity to do a field based experience that encouraged them to focus on reform issues in science and math. (Science educator)

> This project met my goals for providing a field based experience for preservice teachers. The one comment I heard over and over from the preservice teachers was that regardless of any logistical issues, challenges, it was one of the best experiences they had in the program because they had a chance to go out into the schools and experience the type of teaching and learning we talk about in the methods class. (Math educator)

> My sense is that the performance assessment task was one way to really ensure they (preservice teachers) just weren't going into the schools and teaching in the old, traditional way. I don't think performance assessment is the only way to do that, but it is one way to ensure that mentor teachers don't just give them something to do in the classroom that isn't particularly meaningful and isn't consistent with our reform based goals. (Math educator)

The math/science specialist from the ESD viewed the field experience portion of the project from a differing perspective. The inservice teachers were asked to provide mentoring for

a small stipend and also asked to allow an inexperienced preservice teacher into their room to work with their students. The reflections of the ESD partner on the field experience follow:

> It was amazing how supportive and welcoming the inservice teachers were to the preservice teachers. Many (inservice teachers) commented on how important they knew it was to have a chance to get into a real classroom when learning to teach. A couple remarked that they wish they had had this kind of a chance when they were preservice teachers. (ESD math/science specialist)

> One of the difficulties was finding competent mentors to support the field based experience. We tried to be selective but found that many of the inservice teachers that are competent math or science teachers do not have the time or inclination to take on something more. (ESD math/science specialist)

Collaboration

A number of crucial problems with the collaboration were identified at the culmination of this project. These were areas that hindered the project to a certain extent although they did not affect the overall success.

Communication among all players is essential to an effective partnership. In this collaboration, it was helpful that university and ESD members met weekly at first and then bi-monthly for the remainder of the project. Establishing communication with the inservice teacher members was more problematic. Communication with the inservice teachers was difficult, they often took 3-4 days to respond to e-mails or failed to respond altogether. The inservice teachers were required to attend one meeting at the university; most were able to do this although three were not. The positive aspects of the required meeting at the university were that the inservice teachers met the university faculty and ESD personnel in person, had an initial planning meeting with the preservice teachers assigned to them, and made contact with other inservice teachers involved in the program. This meeting was essential to the planning process as all partners were active and participating in the task development simultaneously. It was also important to have

the inservice teachers physically at the university; some of them had never been there before. The inservice teachers valued the planning meetings and expressed the need for more:

> It might have been helpful to have the mentors meet at the college with the students more than once. Also, a way to make sure the mentor and students are meeting on a regular basis. (Shelly, survey)

> I felt a need to meet more often with the preservice teachers. It was difficult to communicate efficiently by e-mail. (Kelly, survey)

It would have been valuable for the university or ESD personnel to meet with the inservice teachers personally or have direct communication with them weekly. This would have provided all partners more knowledge on the progress of the field experience and the inservice teachers would have felt more involved in the project. The inservice mentor teachers needed to be given very specific guidelines and expectations for their role as a partner in the project. For example, the inservice teachers were expected to provide feedback to the preservice teachers who implemented their performance assessment task in their classroom. Most of the mentors did not do an adequate job of this. The mentors were asked to provide feedback but were not given specifics as to how often, when, or what depth to go with the feedback.

A concern that was voiced by members of the partnership was the large amount of time necessary to carry out a project such as this. It took time to include the performance assessment project in the methods classes, time to communicate and meet with other partners, and large amounts of time to observe and provide feedback to the preservice teachers. The partnership as set up, depended upon the ESD partner to do much of the organization of the field experiences. Reflections from the university and ESD partners on the some of the logistical and time concerns follow:

> It would be important to find a way to resolve time issues and perhaps find a way to have this assignment a part of a separate assessment course. (Science educator)

> To make this type of project sustainable, we need the logistical support in planning and matching and some sort of liaison with what is happening at the university and what we need to have happen in the schools, and in this case, the ESD provided that link. If the ESD weren't providing the logistical support they provided, we would need some other form of staff support at the university for these placements. (Math educator)

> When collaborating on a project like this it seems like it is very difficult to get anything ironed out unless everyone is sitting down together at the same table. We did e-mail a lot and talked on the phone but the really effective communication happened when we were all together physically. (ESD math/science specialist)

Conclusions

One conclusion drawn from the evaluation of this project is that providing the preservice teachers with a field-based experience enriched with mentoring from an inservice teacher was valuable to the preservice teachers. Using performance assessment as a focus for this mentorship project emphasized alternative assessment and standards-based instruction and provided a common purpose for all participants. A dilemma science teacher educators face is whether or not field experiences have enough focus so that preservice teachers can practice the new approaches they are learning in their teacher education programs (Anderson, & Mitchener, 1994). This project's field experience for preservice teachers was focused on performance assessment and allowed preservice teachers time to design and implement a task of their own development.

A second conclusion is that the collaboration between the educational agency, the university, and the school districts was powerful and essential to the project as it was designed. The individual partners in the collaboration could not have carried out the project on their own. In order to instruct preservice teachers in performance assessment, organize and monitor the field experiences, recruit and communicate with mentor teachers, and provide classrooms and knowledge of specific contexts for the field based experience, all partners were necessary.

Recommendations

Based on our findings, recommendations will be made for projects similar to this in terms of using performance assessment in a field based experience and for projects attempting similar collaborations.

In order to adequately implement a performance assessment task in a field experience, it was seen that the preservice teachers needed to observe in the classroom prior to the implementation of the task, spend two to three days for implementation of the task, and then revisit the classroom with their results and to receive feedback. It is recommended that clear expectations be given to the mentor teachers on how much, what type, and when to provide feedback to the preservice teachers.

The expertise, experience, and training of the mentor inservice teachers is an important aspect of a field based, focused project such as this. It was difficult to find mentor teachers who were adequately trained to be mentors for performance assessment tasks in math and science. Even though the majority of the mentors said that they had had past training in performance assessment, all but seven mentioned that they did learn something new. It is recommended that very focused training be provided by the project members for participating mentor teachers. In this way, all members would be using the same terminology and understand the complexities of issues relating to assessment. It is also essential to spend the time and effort when recruiting mentor teachers to ensure that the teachers involved are the best available.

The following considerations and recommendations are made in order to form and sustain a strong collaboration and to succeed in a collaborative effort.

One possible solution to the lack of communication from inservice teachers might be to reimburse their time at a specific rate per hour and ask them to log all hours spent on the project.

If teachers feel that the project will reward them for all the time they are able to spend, they may feel more committed to their role. Another important aspect of inservice teachers' commitment to the project would be the value placed on the professional development they gain from participation in the project. They could be compensated with professional development or university credits so that they see value placed on their participation.

The funding of this project was limited by the amount of grant money available. If external funding had been greater, the mentor teachers could have been more adequately supported. In order to develop and provide continuity for a strong collaboration, external funding needs to be extensive and sustainable.

A number of factors hindered the continuation of this collaboration. The lack of external funding to provide stipends for the mentor teachers and a salary for the ESD math/science specialist was the major factor. Also, the change in personnel at both the university and ESD changed the make up of the collaborative partnership. In order for collaborations to maintain their viability and continue to be effective, a minimal amount of personnel turnover is needed.

Summary

This collaborative project was successful in providing a field based experience focused on performance assessment in math and science for preservice teachers. The project was able to positively affect both preservice and inservice teachers' understanding and experiences with performance assessment tasks. The mechanics of collaboration emphasized to all participants that partnerships are valuable and rewarding, although they cannot be sustained without adequate funding, low personnel turnover, and committed school district partners.

References

Akerson, V.L., McDuffie, A, & Morrison, J.A.. (2001, January). *The bridges project: Pairing preservice and inservice teachers for professional development in science, math, and literacy using performance assessment tasks as contexts*. A paper presented at the International Annual Meeting of the Association for the Education of Teachers in Science, Costa Mesa, CA.

Anderson, R., & Mitchener, C. (1994). Research on science teacher education. In D. Gabel (ed.), *Handbook of Research on Science Teaching and Learning*. (pp. 3-44). New York: Macmillan Publishing.

American Association for the Advancement of Science. (1993*) Benchmarks for science literacy: A project 2061 report.* New York: Oxford University Press.

Borko, H., Mayfield, V., Marion, S., Flexer, R., & Cumbro, K. (1997). Teachers developing ideas and practices about mathematics performance assessment: Successes, stumbling blocks, and implications for professional development. *Teaching and Teacher Education, 13* (3), 259-278.

Darling-Hammond, L., & Falk, B. (1997). Using standards and assessment to support student learning. *Phi Delta Kappan, 79*, 190-199.

Dickinson, V.L., Burns, J., Hagen, E., & Locker, K.M. (1997). Becoming better primary science teachers- A description of our journey. *Journal of Science Teacher Education, 8,* 295-311.

Fuchs, L., Fuchs, D., Karns, K., Hanlett, C., &Katzaroff, M. (1999). Mathematics performance assessment in the classroom: Effects on teacher planning and student problem solving. *American Educational Research Journal, 36*, 609-646.

Kelly, M. K., & Kahle, J.B. (1999). *Performance assessment as a tool to enhance teacher understanding of student conceptions of science*. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Boston, MA.

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA: Author.

National Research Council. (1996). *National science education standards*. Washington, DC: National Academic Press.

Putnam, R. & Borko, H. (2000). What do new views of knowledge and thinking have to say about research on teacher learning? *Educational Researcher, 29*, 4-15.

Schoon, K. J. & Sandoval, P. A. (1997). The seamless field experience model for secondary science teacher preparation. *Journal of Science Teacher Education*, 8 (2), 127-140.

Shepard, L. (2000). The role of assessment in a learning culture. *Educational Researcher, 29* (7), 4-14.

Shymansky, J. A., Chidsey, J. L., Henriquez, L., Enger, S., Yore, L. D., Wolfe, E. W., & Jorgensen, M. (1997). Performance assessment in science as a tool to enhance the picture of student learning. *School Science and Mathematics, 97*, 172-183.

Spector, B. S. (1999). *Bridging the gap between preservice and inservice science and mathematics teacher education*. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Boston, MA.